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Boron content and isotopic composition of vent fluids from seafloor arc-backarc hydrothermal systems

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Boron content and isotopic composition of vent fluids collected from seafloor arc-backarc hydrothermal systems in the western Pacific are determined in order to investigate boron behavior during water-rock reaction at high temperature. In sediment-starved hydrothermal systems (Manus Basin, Suiyo Seamount, and Mariana Trough), the boron content and isotopic composition of vent fluids are dependent on type of host rock. The vent fluids from MORB-like basalt-hosted Vienna Woods in the Manus Basin showed low boron content and high delta-11B value, while dacite-hosted PACMANUS and the Suiyo Seamount showed high boron contents and low delta-11B values. The Alice Springs and Forecast Vent field in the Mariana Trough showed values intermediate between them, reflecting reaction of seawater and basalt influenced by slab material. In phase separated hydrothermal systems (North Fiji Basin), boron content and isotopic composition of vent fluids were similar to those in the Vienna Woods. Considering little fractionation of boron and boron isotope during phase separation demonstrated by the previous experimental studies, it is suggested that the host rock in the North Fiji Basin is MORB-like basalt. In sediment-hosted hydrothermal system (Okinawa Trough), the reaction with boron-enriched sediment following seawater-rock reaction resulted in significantly high boron contents and low delta-11B values of vent fluids. The water-sediment ratio was estimated to be ˜2.

Keywords: seafloor hydrothermal system, boron isotope